

REMARKS

This application has been reviewed in light of the Office Action dated November 12, 2003. Claims 1, 3-5, and 10-12 are pending in this application. Claims 8 and 9 have been cancelled, without prejudice or disclaimer of subject matter. Claims 10-12 have been added to provide Applicants with a more complete scope of protection. Claims 1 and 5, which are in independent form, have been amended to define still more clearly what Applicants regard as their invention, in terms that distinguish over the art of record. Favorable reconsideration is requested.

The Office Action rejected Claims 1 and 3-5 under 35 U.S.C. § 103(a) as being unpatentable over European Patent Application No. 0920999 (Imanaka et al.), in view of U.S. Patent No. 5,886,713 (Okada et al.); and Claims 8 and 9 were rejected over Imanaka et al. '999 in view of Okada et al. and European Patent Application No. 0569201 A1 (Ohshima et al.). Applicants respectfully traverse these rejections. Cancellation of Claims 8 and 9 renders their rejection moot.

Applicants submit that amended independent Claims 1 and 5, together with the remaining claims dependent thereon, are patentably distinct from the proposed combination of the cited prior art at least for the following reasons.

The aspect of the present invention set forth in Claim 1 is a liquid discharge apparatus that includes a liquid discharge head comprising a discharge port for discharging liquid, a liquid flow path communicating with the discharge port and having a bubble generating region for generating a bubble, a discharge energy generating element for generating thermal energy for generating the bubble in the liquid inside the bubble generating region, and a movable member facing the discharge energy generating element and spaced apart from the discharge energy generating element, an end portion of the movable member situated at an upstream side in the flow direction of the liquid inside the

liquid flow path being fixed and a downstream end of the movable member being a free end. The apparatus also includes a temperature sensor for periodically detecting, at a predetermined period, a temperature inside the liquid flow path, and a means for controlling or stopping the driving of the discharge energy generating element by estimating that the liquid is no longer being supplied into the liquid flow path, based on data on temperature rise per period, detected by the temperature sensor and printing data.

Among the notable features of Claim 1 is the means for controlling or stopping the driving of the discharge energy generating element by estimating that the liquid is no longer being supplied into the liquid flow path, based on data on temperature rise per period, detected by the temperature sensor and printing data. Support for this feature can be found at least from page 29, line 2, to page 31, line 13, of the as-filed specification. With this feature, the driving of the heat generating member can be controlled or stopped by estimating that the liquid is no longer being supplied into the liquid flow path, based on data on temperature rise per period, detected by the temperature sensor and printing data. By doing so, physical damage to the movable member can be prevented and a printhead capable of efficiently discharging the ink can be continuously provided.

Imanaka et al. '999 relates to a liquid ejecting head, head cartridge, and liquid ejecting apparatus. The Office Action states that "Imanaka et al. teaches a means for controlling or stopping the driving to said discharge energy generating element when a judgment is made that the ink is not supplied normally based on the detection result of the ink supply state inside said liquid flow path", citing column 4, lines 12-19. Applicants submit that nothing in this section of the specification, or any other section of the specification, would teach or suggest the arrangement of a liquid discharge apparatus having the features recited in Claim 1, that the driving of the heat generating member is

controlled or stopped by estimating that the liquid is no longer being supplied into the liquid flow path, on the basis of the data on temperature rise per period and printing data.

Okada relates to a printhead and a printing apparatus using the same. The Office Action states that Okada discloses “. . . a means for controlling or stopping the driving of said discharge energy generating element by judging that the liquid is not normally supplied based on temperature rise per period detected by said temperature sensor”, citing Figure 8 and column 5, lines 10-19. Applicants submit that Figure 8 is a flowchart showing a printing operation sequence performed by a control circuit of the ink-jet printer, and column 5, lines 10-19, discusses performing, automatically, an ink suction recovery operation when an abnormal temperature rise (10° C or more) is detected, and generally that temperature is measured periodically during a printing operation so as to check for an abnormal temperature rise. However, Okada would not teach or suggest the arrangement of a liquid discharge apparatus having the features recited in Claim 1, that the driving of the heat generating member is controlled or stopped by estimating that the liquid is no longer being supplied into the liquid flow path, on the basis of the data on temperature rise per period and printing data.

Accordingly, Applicants submit that at least for the reason discussed above, Claim 1 is patentable over the two cited documents, when taken separately or in any proper combination (if any), and even a combination of both would fail to have the control means as recited in Claim 1.

Independent Claim 5 is a method claim that includes the same feature of controlling or stopping the driving of the discharge energy generating element by estimating that the liquid is no longer being supplied into the liquid flow path, based on the data on temperature rise per period data detected by the temperature sensor and printing data, as discussed above in connection with Claim 1. Accordingly, Claim 5 is believed to

be patentable for at least the same reasons as discussed above in connection with Claim 1.

The other claims in this application, including new Claims 10-12, depend either directly or indirectly from Claim 1, and, therefore, are submitted to be patentable for at least the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, individual consideration or reconsideration, as the case may be, of the patentability of each claim on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and the allowance of the present application.

Applicants' undersigned attorney may be reached in our New York Office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address listed below.

Respectfully submitted,

Peter G. Thuniger
Attorney for Applicants

Registration No. 47,138

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-3801
Facsimile: (212) 218-2200

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